

Abstract

AGU Meeting

December 2011, San Francisco, California

Thermal Reactions between Sulfur Dioxide and H₂O₂ and their Relevance to the Jovian Icy Satellites and Other Small Bodies

Mark J. Loeffler¹ and Reggie L. Hudson¹

Laboratory experiments have demonstrated that magnetospheric radiation in the Jovian system drives reaction chemistry in ices at temperatures relevant to Europa and other icy satellites. Here we present new results on thermally-induced reactions occurring between 50 and 130 K in solid H₂O + H₂O₂ + SO₂ samples. In our studies, we find that warming our three component mixtures induces a thermal reaction that produces SO₄²⁻, and this reaction appears to consume equal amounts of H₂O₂ and SO₂. We suspect that the results may explain some of the observations related to the presence and distribution of H₂O₂ across Europa's surface as well as the lack of H₂O₂ on Ganymede and Callisto. If other molecules prove to be reactive with H₂O₂ at these or at even lower temperatures, then it may also explain why H₂O₂ has been absent from surfaces of many of the small icy bodies that are known to be exposed to ionizing radiation.

Acknowledgements

This work is supported by NASA's Planetary Atmospheres, Outer Planets, Cassini Data Analysis and Planetary Geology and Geophysics programs, and The Goddard Center for Astrobiology.

¹NASA Goddard Space Flight Center, Greenbelt, MD USA (reggie.hudson@nasa.gov / Fax: 301-286-0440)